# Fiberlink®
# 3500 Series

**2 or 4 Channel 3G/HD/SD-SDI Transmission over one or two single mode or multimode fibers.**

**This manual covers the following models:**

**3512 Tx & 3513 Rx:** 2 channels, one way, one MM or SM fiber.

**3514 Tx & 3515 Rx:** 4 channels, one way, one MM or SM fiber.

**3522 Tx & 3523 Rx:** 2 channels, one way, two MM or SM fibers.

**3524 Tx & 3525 Rx:** 4 channels, one way, two MM or SM fibers.

**Download Specific Data Sheet For Your Model at www.commspecial.com**

2 or 4 Channels of Broadcast quality 3G/HD/SD-SDI transmission over one or two single mode or multimode fibers.

The 3500 Series offers re-clocked outputs, and the signal fidelity you have come to expect from Fiberlink®!

CSI Communications Specialties, Inc.

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## Welcome

Thank you for purchasing Communications Specialties, Inc.'s Fiberlink® 3500 Series. The 3500 Series is used to transmit up to 4 channels of 3G/HD/SD-SDI with or without pre-embedded audio and data over a single or dual fiber optic core. The Fiberlink 3500 Series is compatible with single mode or multimode fiber. The system delivers noise-free transmission that retains all of the signals' initial parameters, regardless of fiber optic cable attenuation. The 3500 Series also provides immunity to video pathological signals over the entire link budget and operating temperature range. **The 3500 series consists of a number of transmitter/receiver options. CSI recommends you download the data sheet for your specific model to augment the information in this manual.**

## Features

- Each input signal is equalized and re-clocked prior to fiber optic transmission
- Immunity to pathological signals over entire link budget and operating temperature range
- Compliant with SMPTE ST 425-3, ST 425-5, 424M-2006, 259M-2006, 292-2006
- Supports transmission of SMPTE 305M-2005, 310M-2004, 344M-2000, DVB-ASI
- Supports both Single Mode and Multimode ( 62.5u & 50u) fiber types
- Supports 3G/HD/SD-SDI inputs with embedded audio and data and DVB-ASI.
- 14dB Optical Link Budget - 2.97 Gbps (19dB for high power models)
- Wide operating temperature range: -10° C to +50° C
- Available in Box and Card versions
- Card version compatible with the Fiberlink® 6000A Rack Card Cage
- Designed and Manufactured in the USA by CSI

## Package Contents

This User's Manual and **ONE** of the following Fiberlink® models

- 3512 transmitter
- 3513 receiver
- 3514 transmitter
- 3515 receiver
- 3522 transmitter
- 3523 receiver
- 3524 transmitter
- 3525 receiver

## Part Number Specifications

### Part Number Specification for Transmitter and Receiver Pairs

| Transmitter Part Numbers | Receiver Part Numbers |
|---|---|
| 3512 | 3513 |
| 3514 | 3515 |
| 3522 | 3523 |
| 3524 | 3525 |

### Box and Rack Card Suffix Designations

Each Part Number above must include a suffix designation to indicate the following:

• Box or Card, Wavelength, Optical Connector.

The suffix will look like this example when completed:

Model - B7S = Box, standard laser, ST connector

Model - C7L = Card, standard laser, LC connector

| | | |
|---|---|---|
| Case Style: | Box | -B |
| | Rack Card | -C |
| Wavelength: | MM only (See data sheet) | -3 |
| | Standard Power | -7 |
| | High Power, Single mode only (See data sheet) | -9 |
| Optical Connector: | ST | -S |
| | LC | -L |

## General Specifications

| | | |
|---|---|---|
| Indicators | Power, HD/3G data rate lock<br>SD/DVB-ASI data rate lock<br>Alarm (Card version) | |
| Box Version Dimensions | 6.5W x 1.15H x 6L (in)<br>165W x 29H x 152L (mm) | |
| Weight | 12.3 ounces, 382 grams | |
| Number of slots in 6000A card cage | 3512, 3513, 3522, 3523<br>3514, 3515, 3524, 3525 | 1 Slot<br>2 Slots |
| Power | 9-24 Volts AC or DC<br>Transmitter - 5.0 Watts; 17.66 BTU/Hr<br>Receiver - 4.0 Watts; 13.64 BTU/Hr | |
| Operating Temperature | -10°C to +50°C | |

## 3500 Transmitter Specifications * (3512, 3514, 3522, 3524)

### Serial Video BNC Inputs

| | |
|---|---|
| Number of Inputs | 2 or 4 BNC, 75 Ohms |
| Data Rate Range | 19.4 Mbps to 2.97 Gbps |
| Standards Supported | SMPTE ST 425-3, ST 425-5, 424M-2006, 259M, 292, 305M, 344M, DVB-ASI |
| Re-clocked Data Rates | 270 Mbps (SMPTE 259M, DVB-ASI-270)<br>1.485 Gbps (SMPTE 292)<br>2.97 Gbps (SMPTE 424M-2006) |
| Equalization | Automatic up to 100m of Belden 1694A at 2.97Gbps, 140m at 1.485 Gbps and 180m at 270 Mbps |
| Return Loss | >10dB up to 2.97 Gbps |
| Signal Level | 800mv ±10% |
| DC Offset | 0V ±0.5V |
| Rise/Fall Time | <135 ps at 2.97 Gbps per SMPTE 424M;<br><270ps at 1.485 Gbps per SMPTE 292;<br>0.4 to 1.5ns at 270 Mbps per SMPTE 259M |

## 3500 Transmitter Specifications * (3512, 3514, 3522, 3524) (cont.)

| | |
|---|---|
| Overshoot | <10% of Amplitude |
| Timing Jitter | <0.2 UI at 270Mbps; <1.0 UI at 1.485 Gbps;<br><2.0 UI at 2.97 Gbps with color bar signal applied |
| Alignment Jitter | <0.2UI at 270Mbps, <0.2UI at 1.485 Gbps;<br><0.3 UI at 2.97 Gbps with color bar signal applied |
| Re-clocking | At 270 Mbps, 1.485 Gbps & 2.97 Gbps |

**Optical Output**

| | |
|---|---|
| Connector | LC or ST receptacle, PC polish |
| Wavelength * | 1310nm -1570nm |
| Emitter Type * | DFB Laser or FP Laser |
| Maximum Output Power * | -1 dBm |

## 3500 Receiver Specifications * (3513, 3515, 3523, 3525)

**Optical Input**

| | |
|---|---|
| Connector | LC or ST receptacle, PC polish |
| Wavelength * | 1310nm-1570nm |
| Minimum Input Power * | -17 dBm at 2.97 Gbps,<br>-20 dBm at 1.485 Gbps,<br>-20 dBm at 270 Mbps |
| Maximum Input Power | -1 dBm |

**Serial Video BNC Outputs**

| | |
|---|---|
| Number of Outputs * | 2 or 4 BNC, 75 Ohms, non-inverting |
| Signal Level | 800mv ±10% |
| DC Offset | 0V ±0.5V |

*** See Specific Data Sheet For Your Model**

## Technical Specifications

| 3500 Receiver Specifications * (3513, 3515, 3523, 3525) (cont.) | |
|---|---|
| Rise/Fall Time | <135ps at 2.97 Gbps per SMPTE 424M;<br><270ps at 1.485 Gbps per SMPTE 292;<br>0.4 to 1.5ns at 270 Mbps per SMPTE 259M |
| Overshoot | <10% of Amplitude |
| Timing Jitter | <0.2UI at 270Mbps, <1.0UI at 1.485 Gbps;<br><2.0UI at 2.97 Gbps with color bar signal applied |
| Alignment Jitter | <0.2UI at 270Mbps, <0.2UI at 1.485 Gbps;<br><0.3UI at 2.97 Gbps with color bar signal applied |
| Re-clocking | At 270 Mbps, 1.485 Gbps and 2.97 Gbps |

*** See Specific Data Sheet For Your Model**

| 3500 Transmitter / Receiver * System Specifications | | |
|---|---|---|
| **Operating Loss Budget** ** | | |
| Single Mode Fiber | 0-14 dB at 2.97 Gbps<br>0-15 dB at 270 Mbps | 0-15 dB at 1.485 Gbps |
| Multimode Fiber (62.5u) | 0-14 dB at 2.97 Gbps<br>0-15 dB at 270 Mbps | 0-15 dB at 1.485 Gbps |
| Multimode Fiber (50u) | 0-14 dB at 2.97 Gbps<br>0-15 dB at 270 Mbps | 0-15 dB at 1.485 Gbps |
| **Maximum Useable Distance** ** | | |
| Single Mode Fiber | 50 km at 2.97 Gbps<br>55 km at 270 Mbps | 55 km at 1.485 Gbps |
| Multimode Fiber (62.5u) | 0.8 km at 2.97 Gbps<br>2.5 km at 270 Mbps | 1 km at 1.485 Gbps |
| Multimode Fiber (50u) | 1 km at 2.97 Gbps<br>3 km at 270 Mbps | 1.3 km at 1.485 Gbps |

*** See Specific Data Sheet For Your Model**

** Distance specifications are approximate, based upon connecting a 3500 Transmitter to a 3500 Receiver, and are not guaranteed. CSI cannot estimate or guarantee operating loss budgets when the 3500 Series is used with other, non-Fiberlink devices. Operating loss budget must not be exceeded. See data sheet for your specific model(s).

## Installation Instructions

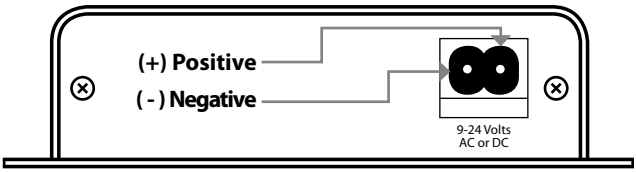
The Fiberlink® 3500 Series of fiber optic transmission systems are ready for immediate use and do not require any special tools or equipment. However, an Optical Power Meter, such as the Fiberlink® 6650, can be useful in determining optical loss budgets during your systems design and maintenance.

**The following instructions describe the typical installation procedure:**

1) Connect the video source to the video input BNC connector on the transmitter unit.
2) Connect the video output cable to video output BNC connectors on the receiver unit.
3) Terminate any unused BNC output connector at 75 Ohms.
4) Connect the fiber optic cable to the transmitter and receiver units.
5) Connect the Universal Power Supply to the transmitter and receiver units. For box versions using DC power, please refer to figure 1.
6) When power is applied, the green POWER LED should illuminate, indicating the presence of operating power. The 3G/HD/SD RATE LED will give an indication as described in the Indicator LED's and Alarm Circuitry section of this manual.
7) The system should now be operational.

*Note: The Rack Card version has an additional red LED for indicating the presence of an alarm condition (loss of signal). Refer to Indicator LED's and Alarm Circuitry sections of this manual.*

**Figure 1:**
**Power Connector**
**DC Input Polarity**



**The transmitting element in the Fiberlink® 3500 transmitter unit contains a solid state Laser Diode located in the optical connector. This device emits invisible infrared electromagnetic radiation which can be harmful to human eyes. The radiation from this optical connector, if viewed at close range with no fiber optic cable connected to the optical connector, may be sufficient intensity to cause instantaneous damage to the retina of the eye. Direct viewing of this radiation should be avoided at all times!**

## Alarm Switch Settings & Options

The Rack Card version of this product has an additional red indicator LED that illuminates when an alarm condition exists.

The rack card unit also provides an output to drive a model 6020A Alarm Sensing Module which provides an audible tone and activates a set of contacts for external signaling purposes.

### Alarm Switch Settings for the Transmitter Card

| Switch Position | Alarm Indication | On | Off |
|---|---|---|---|
| 1 | Ch 1 Loss of Input Video | Enabled | Disabled |
| 2 | Ch 2 Loss of Input Video | Enabled | Disabled |
| 3 (3514 & 3524 Only) | Ch 3 Loss of Input Video | Enabled | Disabled |
| 4 (3514 & 3524 Only) | Ch 4 Loss of Input Video | Enabled | Disabled |

### Alarm Switch Settings for the Receiver Card

| Switch Position | Alarm Indication | On | Off |
|---|---|---|---|
| 1 | Ch 1 Loss of Optical Signal | Enabled | Disabled |
| 2 | Ch 2 Loss of Optical Signal | Enabled | Disabled |
| 3 (3514 & 3524 Only) | Ch 3 Loss of Optical Signal | Enabled | Disabled |
| 4 (3514 & 3524 Only) | Ch 4 Loss of Optical Signal | Enabled | Disabled |

## Indicator LEDs

The Fiberlink® 3500 Series has four integral indicator LEDs that are used to monitor the state of the unit. Card versions have an additional Alarm LED.

### Transmitter LEDs (For Each Channel)

| LED | Status | Definition |
|---|---|---|
| Power | On | Indicates that correct power has been applied. |
| HD/3G Rate | Off<br>On | Indicates no HD/3G-SDI data rate lock<br>Indicates HD/3G-SDI data rate lock at 1.485Gbps, 2.97 Gbps, or 2.97/1.001 Gbps |
| SD Rate | Off<br>On | Indicates no SD-SDI or DVB-ASI data rate lock<br>Indicates SD-SDI or DVB-ASI data rate lock at 270 Mbps |
| Alarm | On | Loss of input video (card version only) |

*Note: The 3G, HD and SD LEDs indicators are off when a non-standard signal is applied.*

### Receiver LEDs (For Each Channel)

| LED | Status | Definition |
|---|---|---|
| Power | On | Indicates that correct power has been applied. |
| HD/3G Rate | Off<br>On | Indicates no HD/3G-SDI data rate lock<br>Indicates HD/3G-SDI data rate lock at 1.485Gbps, 2.97 Gbps, or 2.97/1.001 Gbps |
| SD Rate | Off<br>On | Indicates no SD-SDI or DVB-ASI data rate lock<br>Indicates SD-SDI or DVB-ASI data rate lock and re-clocked video available on outputs |
| Alarm | On | Loss of optical signal (card version only) |

*Note: The 3G, HD and SD LEDs indicators are off when a non-standard signal is applied.*

## Operating Pointers

Remember to check attenuation of the fiber optic cable. The system will only operate properly if these specifications fall within the range of the system's loss budget.

Note: If no signal is applied to the 3500 Transmitter, no optical power will be present on the 3500 Transmitter's output.

## Troubleshooting

Multimode fiber optic cable contains an optical fiber with a light carrying "core" that is only .0025 inches (62.5 microns) in diameter. Single mode fiber optic cable has an even smaller "core," only .00032 to .0004 inches (8-10 microns). This is smaller than a human hair! Therefore, any minute particles of dirt or dust can easily block the fiber from accepting or radiating light. To prevent this from happening, always use the provided dust caps whenever optical connectors are exposed to air. It is also a good idea to gently clean the tip of an optical connector with a lint-free cloth moistened with alcohol whenever dust is suspected.

The status of the LEDs should provide the first clue as to the origin of any operational failure. If these are off, it usually means that the fiber is broken or has too much attenuation. Next, be certain that the input and output signal connections are correct.

An optical power meter, such as the Fiberlink® 6650, a visible light source, such as the Fiberlink® 6656, and a Dual Wavelength Light Source, such as the Fiberlink® 6652 for Multimode or 6654 for Single Mode, can greatly assist and expedite troubleshooting of fiber optic transmission systems and are recommended tools all installers should have available.

Finally, although multimode and single mode devices may look the same, they will not operate properly together. Using the wrong device or fiber can easily add more attenuation than specified, resulting in poor overall performance. It should be noted that some of our fiber optic products support both single mode and multimode fiber in the same unit.

If, after reviewing the above possibilities, the system is still not operating, please contact the Customer Service Department for further assistance. If you suspect your problem is caused by the optics or the fiber optic cable, and you have an optical power meter, please take the appropriate measurements prior to contacting customer service.

## Maintenance and Repairs

The Fiberlink® 3500 Series has been manufactured using the latest semiconductor devices and techniques that electronic technology has to offer. They have been designed for long, reliable and trouble-free service and are not normally field repairable.

Should difficulty be encountered, Communications Specialties maintains a complete service facility to render accurate, timely and reliable service of all products.

The only maintenance that can be provided by the user is to ascertain that optical connectors are free of dust or dirt that could interfere with light transmission and that electrical connections are secure and accurate. Please see the Troubleshooting section of this manual for additional information.

An optical power meter, such as the Fiberlink® 6650, a visible light source, such as the Fiberlink® 6656, and a Dual Wavelength Light Source, such as the Fiberlink® 6652 for Multimode or 6654 for Single Mode, can greatly assist and expedite troubleshooting of fiber optic transmission systems and are recommended tools all installers should have available.

All other questions or comments should be directed to our Customer Service Department. It should be noted that many "problems" can easily be solved by a simple telephone call.

If you suspect your problem is caused by the optics or the fiber optic cable, and you have an optical power meter, please take the appropriate measurements prior to contacting customer service.

## Certifications

## Warranty

Communications Specialties, Inc. (CSI) warrants that, for a period of three years after purchase by the Buyer, this product will be free from defects in material and workmanship under normal use and service. A Return Material Authorization (RMA) number must be obtained from CSI before any equipment is returned by the Buyer. All materials must be shipped to CSI at the expense and risk of the Buyer.

CSI's obligation under this warranty will be limited, at its option, to either the repair or replacement of defective units, including free materials and labor. In no event shall CSI be responsible for any incidental or consequential damages or loss of profits or goodwill.

CSI shall not be obligated to replace or repair equipment that has been damaged by fire, war, acts of God, or similar causes, or equipment that has been serviced by unauthorized personnel, altered, improperly installed, or abused.

RMA numbers and repairs can be obtained from:

**Communications Specialties, Inc.**
125 Comac Street
Ronkonkoma, New York 11779 USA
Tel: (631) 273-0404
Fax: (631) 273-1638

**Please have your serial number available.**

## Fiberlink® 6656 Visible Light Source

The Fiberlink® Visible Light Source provides a visible 650 nm laser output that can be used for identifying fiber breaks and individual fibers within fiber bundles, allowing for convenient, on-site testing of fiber networks during construction and maintenance procedures.

## Fiberlink® 6650 Optical Power Meter

The Fiberlink® Optical Power Meter measures the power of optical signals at 850, 980, 1310 and 1550nm wavelengths, allowing for convenient, on-site testing of fiber networks during construction and maintenance procedures. It can be used to measure the power of an optical signal reaching the receiving end of a fiber optic cable, as generated either by a transmitter unit or by a light source such as the 6652 or 6654.

## Fiberlink® 6652 and 6654 Dual Wavelenth Light Source

The Fiberlink® Dual Wavelength Light Sources offer a laser output at wavelengths of 1310 and 1550 nm (6654) for single mode fiber and 850 nm and 1300nm (6652) for multimode fiber. Both models allow for convenient, on-site testing of fiber networks during construction and maintenance procedures.

## Related Products

# Fiberlink® 3360 3G/HD/SD-SDI & 4 Pair AES Audio Series

The Fiberlink® 3360 Series allows you to transmit 3G, HD or SD-SDI as per SMPTE 424M-2006, 292 and 259 with the ability to embed up to 8 channels (4 pairs) of AES/EBU digital audio. Convenient switches on the 3360 Series transmitter allow the operator to embed each of the four pairs of audio independently, to strip previously serialized audio, or to pass it through without modification. At the receive end of the fiber optic link, the operator can decide which audio pairs they need de-embedded.

Audio signals are not required to operate the Fiberlink® 3360 link and it can be used as a stand-alone 3G/HD/SD-SDI optical link. Previously serialized data is left intact throughout the entire transmission process and the 3360 Series is immune to pathological signals over the entire budget link and operating temperature range.

Signals are equalized and re-clocked prior to fiber optic transmission and the 3361 receiver features a re-clocked SDI output.

The 3360 Series is compliant with SMPTE 297-2006 and has the ability to operate seamlessly with Fiberlink® Matrix and other SMPTE 297-2006 fiber optic compliant devices.

Available in card versions and a small footprint box version, it is ideal for broadcast or corporate studios, OB vans, rental and staging, auditoriums, stadiums and theaters, airport or transportation hubs, distance learning, surgical or medical imaging and more

**Learn more at commspecial.com**

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The 3500 Series offers re-clocked outputs, and the signal fidelity you have come to expect from Fiberlink®!

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P/N 129849 Rev B
01/23/2014